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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/501,501 | 06/28/2004 | Christoph Gauer | 298-248 | 8274 |

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| EXAMINER | |
|---|---|
| KINGAN, TIMOTHY G | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 4151 | |

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/501,501 | GAUER, CHRISTOPH | |
| | Examiner | Art Unit | |
| | TIMOTHY G. KINGAN | 4151 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *28 June 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *28 June 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *06/28/2004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Priority*

1. Receipt is acknowledged of a certified copy of the foreign priority document of the 10/501,501 application.

2. If this copy is being filed to obtain the benefits of the foreign filing date under 35 U.S.C. 119(a)-(d), applicant should also file a claim for such priority as required by 35 U.S.C. 119(b) in the oath or declaration or in an application data sheet. If the application being examined has entered the national stage from an international application filed on or after November 29, 2000, after compliance with 35 U.S.C. 371, the claim for priority must be made during the pendency of the application and within the time limit set forth in the PCT and Regulations of the PCT. See 37 CFR 1.55(a)(1)(ii). Any claim for priority under 35 U.S.C. 119(a)-(d) or (f) or 365(a) or (b) not presented within the time period set forth in 37 CFR 1.55(a)(1) is considered to have been waived. If a claim for foreign priority is presented after the time period set forth in 37 CFR 1.55(a)(1), the claim may be accepted if the claim properly identifies the prior foreign application and is accompanied by a grantable petition to accept an unintentionally delayed claim for priority. See 37 CFR 1.55(c).

***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. Claims 1-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over A. Wixforth, U.S. Patent Application Publication 2001/0055529 (herein after Wixforth).

4. For Claim 1, Wixforth teaches moving individual drops of a liquid forward [0012] and that two drops of liquid can be moved toward each other for mixing and purposes of a reaction (titration). Wixforth teaches application of liquid sample on the chip 2 ([0075] and Fig. 1) (flat surface). Wixforth also teaches that

drops of liquid being transported do not run away from each other (are held together) because of surface tension [0012].

Wixforth is silent on the relative sizes of drops of titrant and analyte drops. Wixforth teaches small drop-shaped quantities of liquid (titrant) separated and transported from the rest of the volume to reservoir 13 where it comes in contact with a quantity of analyte ([0077] and Fig. 1) for reaction (p. 9, Claim 25). One of ordinary skill in the art would recognize that if starting reservoir and analyte drops are of equal volume, titrant drops separated from the remaining reservoir drop will be smaller than analyte drop.

Wixforth teaches the use of analysis stations on the chip surface in which matter interacts with a measurement quantity, such as illumination, for measurement [0014] with respect to a physical, chemical or biological characteristic [0044]. One of ordinary skill in the art would recognize that additional drops of titrant may be separated from the remaining reservoir drop and that measurements may be repeated, since such measurements have no additional requirements.

5. For Claim 2, Wixforth teaches use of surface acoustic waves sent to at least one quantity of matter (analyte drop) for mixing (p. 9, Claim 27), after at least two quantities of material are brought into contact (p. 9, Claim 25 and [0054]), [0082].

6. For Claim 3, Wixforth teaches the process of moving at least two quantities of matter into contact on the solid-body surface, thus moving one quantity (titrant) towards the other quantity (analyte) [0054].

7. For Claim 4, Wixforth teaches bringing a quantity of liquid to the chip [0075], at least part of which is to be used as a reservoir for matter (titrant) (p. 10, Claims 46-47) that can be set in motion (is held together) because of surface tension [0076]. Wixforth further teaches that one quantity of the liquid can be separated from the rest [0039], [0046], [0077] and such liquid can be set in motion and moved forward [0047] to bring it into contact with a second drop of liquid [0041] (analyte).

8. For Claim 5, Wixforth teaches movement of individual drops (titration quantities) forward [0012] in response to surface waves [0013], and such movement results from the impulse transfer of the surface wave or waves to drops [0006], [0019].

9. For Claim 6, Wixforth teaches one or more interdigital transducers [0028] that may be used on a piezoelectric substrate (solid surface) [0030], [0048], and that such transducers are used to generate surface acoustic waves [0028] with a direction of emission perpendicular to the axis of the transducer [0028] which can be arrange for waves in the direction of the desired momentum transfer (Figs. 1-5).

10. For Claim 7, Wixforth teaches bringing a quantity of liquid (analyte) to the chip [0075], and that the chip's surface or parts or regions (analysis point) of the surface may be modulated in wetting properties by coating to define hydrophobic and hydrophilic regions [0021]. Wixforth teaches that such regions [0072] (analysis point) may be hydrophilic with respect to surrounding region [0071] and will therefore be more strongly wetted.

11. For Claim 8, Wixforth teaches that a quantity of liquid may be reversibly immobilized (anchored) on the surface of the solid by appropriate functionalization such as imparting different wetting properties than the surrounding surface [0053], such as by defining hydrophobic and hydrophilic regions according to Claim 7 above [0021]. Further, Wixforth teaches that reservoir regions 11 (Fig. 1) are more hydrophilic [0071] than the surrounding region so that matter (reservoir drop) preferentially stays in this region [0072] since it is more strongly wetted than more the hydrophobic surrounding region.

12. For claim 9, Wixforth teaches application of liquid sample on the chip 2 [0075] (solid surface) and that one quantity of the liquid (titrant) can be separated from the rest [0046] (reservoir) and that such titrant can be guided from a reservoir on a conducting path formed by surface modulation of wetting properties [0021] to bring it into contact with a second drop of liquid [0041] (analyte). Wixforth teaches movement of both drops toward each other [0041] but is silent on movement of titrant to fixed analyte. One of ordinary skill in the art would find obvious to move a single drop toward a fixed second drop in order to affect a reaction, since such single drop movement would require fewer transducers on the substrate for moving liquid drops.

13. For Claim 10, Wixforth teaches that one quantity of the liquid (titrant) can be separated from the rest [0046] (reservoir drop), and that such titrant can be guided from a reservoir on a conducting path [0021] to a receiving reservoir [0072] (anchor point) or an analysis point [0085], Figs. 1-3. Wixforth is silent on the width of the connection region. Wixforth teaches that, while conducting paths

for liquid transport [0020] can be defined in their breadth [0021], movement of matter (reservoir drop) (off anchor points 11 and 13 (Fig. 1)) is caused by surface waves [0006]. Therefore, one of ordinary skill would find obvious that conducting paths 15 (Fig. 1) may be made sufficiently narrow to prevent a drop from leaving the anchor point in the absence of an external force.

14. For Claim 11, Wixforth teaches that a drop can be moved intact on a path from one reservoir to another defined by surface-wetting properties [0075] (is more strongly wetted by liquid) and that such path is smaller in contact area than that of the reservoir drop (Figs. 1-3). Wixforth also teaches that direction of such drops can be changed by an appropriately positioned transducer [0084], from a supply reservoir to a receiving reservoir. Wixforth teaches that conducting paths can be functionalized, using a number of alternative technologies [0049], to modulate the wetting properties of paths with respect to surrounding surface [0021]. Wixforth is silent on use of a region on the surface, 41, to separate a titration quantity. One of ordinary skill in the art would be motivated to apply Wixforth's teachings of positioning transducers and modulating wetting properties of paths in order to achieve an alternative approach to generating titrant drops and thereby expand the range of efficient and reliable means of separating titrant drops from a larger reservoir drop.

15. For Claim 12, Wixforth is silent on use of a climatic chamber. One of ordinary skill in the art would find obvious the potential for use of a climatic control chamber in order to maintain volume and prevent drying from the boundaries of very small drops of liquid during and after the time of application of

such drops, their movement on the substrate and their interaction with each other for purposes of measuring a reaction.

16. For Claim 13, Wixforth teaches launching a surface acoustic wave in the direction of an analysis point [0085]. Further, Wixforth teaches matter can be irradiated with a surface wave for the purpose of studying the effect on the surface acoustic wave [0051]. Wixforth is silent on the period of such study, during and/or after the reaction, and on parameters of the wave. One of ordinary skill in the art would recognize the potential for studying such effects throughout and after the reaction in order to obtain data reflecting kinetic properties of the reaction and that such study on acoustic waves would require choice of parameters of the wave to measure; implicit in such study is measurement of change in a specific property of the wave.

17. For Claim 14, Wixforth teaches the analysis of matter within at least one region on the surface for at least one physical, chemical or biological characteristic (p.9, Claim 19). One of ordinary skill would recognize that reaction heat is one such physical property, since the free energy of a chemical reaction includes an enthalpic component, that of giving off to or absorbing heat from its surroundings.

18. For Claim 15, Wixforth teaches the analysis of matter within at least one region on the surface for at least one property, including electric (p. 9, Claim 21). One of ordinary skill would recognize that electrical conductivity is one such electric property, since ability to complete an electric circuit deriving from charged analytes in solution forms the basis for such conductivity.

19. For Claim 16, Wixforth teaches the analysis of matter within at least one region on the surface for at least one property, including optical (p. 9, Claim. 21). One of ordinary skill would recognize that color change is one such optical property, since such change is based in the absorption/transmission properties of light with respect to wavelength that is measured with optical detectors or by eye.

20. For Claim 17, Wixforth teaches the analysis of matter within at least one region on the surface for at least one physical, chemical or biological characteristic (p.9, Claim 19). One of ordinary skill would recognize that pH is one such chemical property, since pH is a numerical parameter representing concentration of acid (a chemical) in solution.

21. For Claims 18-20, Wixforth teaches that an interdigital transducer may be operated to generate acoustic surface waves, according to an inverse piezoelectric effect, spreading perpendicular to the axis of the transducer [0028]. Wixforth further teaches that such piezoelectric effect can be generated in a substrate if a piezoelectric substrate is used [0030], and that the direction of emission of such waves is controlled by orientating the transducers on the substrate for desired momentum transfer (Figs. 1-4).

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to TIMOTHY G. KINGAN whose telephone

number is (571)270-3720. The examiner can normally be reached on Monday-Friday, 8:30 A.M. to 5:00 P.M., E.S.T..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mikhail Kornakov can be reached on 571 272-1303. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

TGK

/Michael Kornakov/
Supervisory Patent Examiner, Art Unit 4151